

COMPARISON OF SERUM γ -GT, ASAT,
ALAT AND ALP LEVELS IN HEPATIC DISEASES

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SUMMARY:

The purpose of this study was to determine a simple and sensitive test for clinical diagnosis of various hepatic diseases. Therefore γ -glutamyltranspeptidase (γ -GT), aspartate aminotransferase (ASAT), alanine aminotransferase (ALAT) and alkaline phosphatase (ALP) levels were measured in 29 healthy adults and 88 sera with various liver diseases. Table I represents the results, according to which γ -GT activity increases in all of studied patients, especially in alcoholic liver disease and hepatobiliary dysfunction (13, 5, 3, 10, 4).

The data suggest that in liver disease it is better to estimate γ -GT level in serum prior to other related enzymes.

INTRODUCTION

The activity of various enzymes have been identified in serum and studied extensively in a variety of conditions such as hepatic disease, myocardial infarction etc...

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Some serum enzyme determinations have been applied widely to clinical problems and there are a regular determination for routine follow-up in hospitals and clinics, such as aspartate aminotransferase (ASAT), alanine aminotransferase (ALAT), alkaline phosphatase (ALP), lactic dehydrogenase (LD) and creatine phosphokinase (CPK).

Several other enzyme determinations such as glutamyl-transpeptidase (γ -GT) are employed much less widely. Whereas serum γ -GT level is increased in hepatobiliary disease, especially in alcoholic liver disease and patients taking drugs (e.g. phenytoin). (4,6,9,10,11).

Therefore we measured serum level of γ -GT, to compare with ASAT, ALAT and ALP in various liver disease such as: chronic active hepatitis, persistent chronic hepatitis, alcoholic fatty liver, fatty liver not related to alcohol, hepatic cirrhosis, acute viral hepatitis and obstructive icterus.

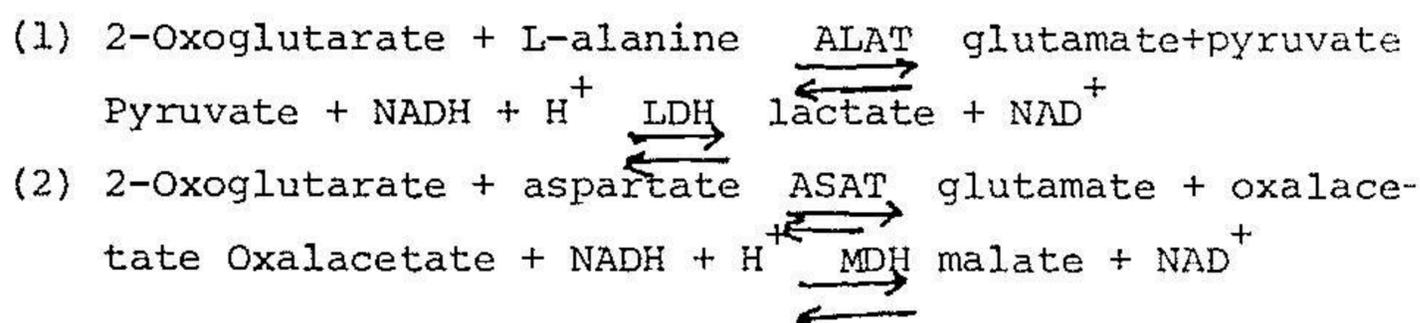
MATERIALS AND METHODS:

Eighty eight sera were obtained from patients with various ages from Department of Infectious Disease and Surgery Emmam Khomeyni Hospital during the year 1985-1986.

Patients were divided, on the basis of anamnestic, and diagnostic data, into the following groups:

Chronic active hepatitis	18 cases
Persistent chronic hepatitis	16 "
Fatty liver not due to alcohols	15 "
Hepatic cirrhosis	18 "
Acute viral hepatitis	21 "
Obstructive icterus	26 "

and 29 healthy sera from hospital personel and students were taken as normals. In order to establish the reference levels of enzymes, venous blood samples were drawn from hospitalized fasting patients at 6-8 a.m. and were centrifuged after two hours. Serum activities of aspartate aminotransferase (ASAT, EC. 2.6.1.1.) and alanine aminotransferase (ALAT, EC. 2.6.1.2) were measured by method of Merckotest UV Test, Kits No. 3398 for ASAT and 3397 for ALAT at 25° C, according to following equations:



The rate of NADH consumption was measured photometrically which is directly proportional to the ALAT (GPT) or ASAT (GOT) activity in the sample.

(3) - γ -Glutamyltranspeptidase (GGTP or γ -GT, EC 2.3.2.2) activity was estimated by Merckotest Kit No 3394 according to modified method of Szasz (12), in which L- γ -glutamyl-4 nitroanilide is the substrate and glycylglycine is the receptor 5-Amino-2-nitrobenzoate is formed which also absorbs at 405 nm. Therefore γ -GT activity was determined by measuring the change in optical density per unit time at 25° C.

(4) - Alkaline phosphatase (ALP, EC 3.9.3.1) was determined according to Bessey, Lowry and Brock, Merckotest Kit No. 3304, in which p-nitrophenyl-phosphate is used as substrate which is dissociated by the enzyme into p-nitro-phenolate and inorganic phosphate. The reaction is stopped by the addition of sodium hydroxide The liberated

p-nitrophenolate occurs as a yellow anion which is determined photometrically at 405 nm.

RESULTS:

Table 1 summarizes the cases examined, showing the mean and standard deviation value for each type of enzyme.

TABLE I
SERUM ENZYMES ACTIVITIES IN VARIOUS HEPATIC DISEASES

Enzymes	Normal Liver	Chronic Active Hepatitis	Chronic Persistent Hepatitis	Alcoholic Fatty Liver	Fatty Liver Not Due to Alcohol	Hepatic Cirrhosis	Acute Viral Hepatitis	Obstructive Icterus
ALAT	18.33±6.2	127.6±43	74.5±48.1	63.1±9.6	45.5±16	36.1±10.8	865±184.4	64.25±22.83
ASAT	17.64±3.8	146.2±63.7	73±56.9	57.2±11.4	36.8±21.4	80.5±31.2	688.2±320	105.75±34.17
γ-GT	15 ±4.8	126 ±48.7	69.4±25	439±36.4	47.5±8.1	115.4±38.6	185.5±56	245.6±97.25
ALP	5.2±3.3	69.6±24.5	58.2±39.3	110.7±16.3	65.8±32.6	110.6±24	218.6±47.2	314.32±163.21

- Values expressed as mean ±SD.

- All values are expressed in U/l.

DISCUSSION:

Increased serum enzyme levels are seen in all of liver diseases, but rates of elevation differs in various groups:

1) In acute viral hepatitis, the ALAT values are higher than ASAT so that the De Ritis quotient (ASAT/ALAT) falls to less than 0.7. 95-98% of cases of acute viral hepatitis can also be correctly diagnosed with this quotient but in different types of viral hepatitis, and in children quotient need not necessarily be less than 1. In approximately 25% of patients with viral hepatitis, the accompanying cholestasis, which is not always apparent is always present, the ASAT values reach the same level as those of ALAT and ALP, but γ -GT increases sharply. If the disease proceeds without complications, it is sufficient to measure γ -GT activities at intervals of 2-4 weeks after the acute symptoms have disappeared (2,6).

2) In chronic persistent hepatitis (CPH) and chronic active hepatitis (CAH), transaminase values are very higher than normal range and also CAH is more than CPH and DE Ritis quotient is close to 1. ALP values are normal but γ -GT levels are greater than normal and in patients with CAH is significantly higher than CPH patients (6,7, 13,14)

3) There are various pathogenic factors which are responsible for fatty liver. According to Table I, transaminases activities (ALAT, ASAT) usually increase significantly in alcoholic fatty liver and fatty liver not due to alcohol. ALAT activity is generally somewhat higher than ASAT. ALP activity is usually normal. γ -GT in-

creases markedly, especially when fatty liver is increased by alcohol abuse (4,10).

4) The activities of the ASAT and ALAT are normal to moderately elevated in inactive cirrhosis and only increase significantly when the disease becomes acute, and De Ritis quotient is 1. ALP is normal or slightly elevated. γ -GT increases considerably, especially in alcoholic-toxic cirrhosis (7-10-1).

5) The transminases only increase markedly in the initial stages of obstructive icterus. The activities then return to values lying close to the normal range. ALP and γ -GT rise and levels become up to 3,000 u/p (5,6,8,9).

Therefore the results demonstrate that γ -GT activity is increased in different types of liver diseases, especially in patients with alcoholic liver disease. In addition, higher number of increased γ -GT was observed rather than ALAT or ALP.

Obviously this results suggests a higher sensitivity of γ -GT activity determination for the detection of liver disease especially hepatobiliary and alcoholic toxic patients, and we can apply the γ -GT test for the routine follow up.

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